FAIRCHILD SEMICONDUCTOR®

March 2007

PDP SPM™

FVP12030IM3LEG1
Energy Recovery

Feature

- Use of high speed 300V IGBTs with parallel FRDs
- Single-grounded power supply by means of built-in HVIC
- Sufficient current driving capability for IGBTs due to adding a buffer
- Isolation rating of 1500Vrms/min.
- Low leakge current due to using an insulated metal substrates

General Description

It is an advanced smart power module(SPM™) that Fairchild has newly developed and designed to provide very compact and optimized performance for the energy recovery circuit of PDP driving system. It combines optimized circuit protection and drive matched to low-loss and high speed IGBTs. Under voltage lock-out protection function enhances the system reliability . The high speed built-in HVIC provides opto-couplerless single power supply IGBT gate driving capability that futher reduce the overall system size of PDP sustaining boards.

Applications

- Energy Recovery Part of a PDP (Plasma Display Panel)

Package Outlines

Figure 1.

Pin Configurations

Top View

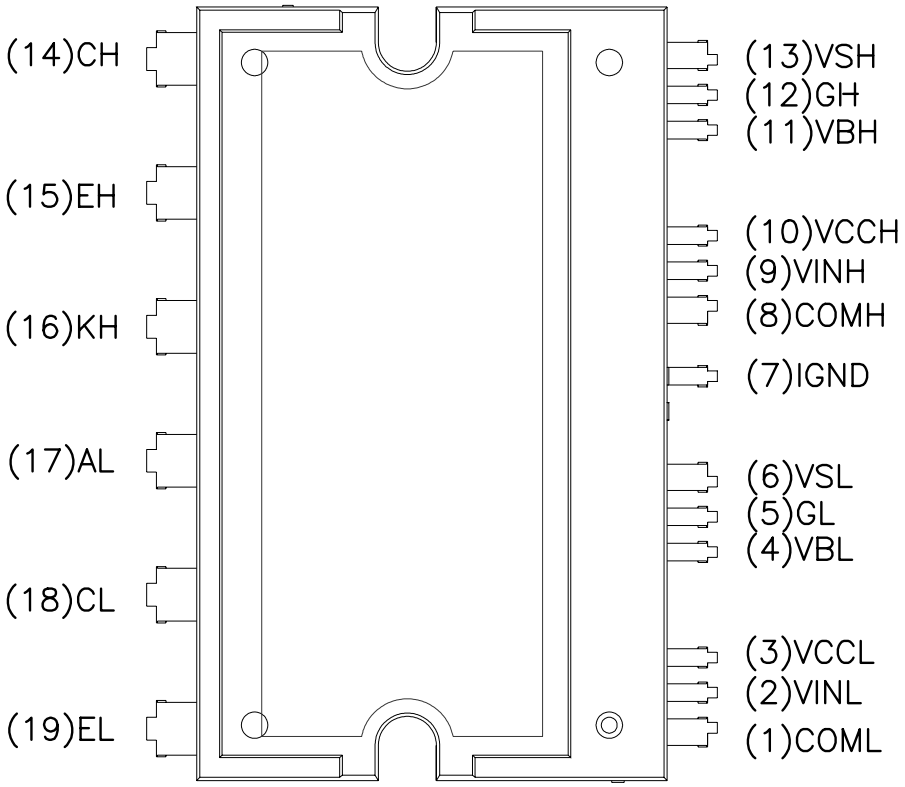


Figure 2.

Pin Descriptions

Pin Number	Pin Name	Pin Descriptions
1	COML	Low-side Signal Ground
2	VINL	Low-side Signal Input
3	VCCL	Low-side Supply Voltage for HVIC
4	VBL	Low-side Floating Supply Voltage for Buffer IC and IGBT Driving
5	GL	Low-side Gate
6	VSL	Low-side Floating Ground for Buffer IC and IGBT Driving
7	IGND	IMS Ground
8	COMH	High-side Signal Ground
9	VINH	High-side Signal Input
10	VCCH	High-side Supply Voltage for HVICg
11	VBH	High-side Floating Supply Voltage for Buffer IC and IGBT Driving
12	GH	High-side Gate
13	VSH	High-side Floating Ground for Buffer IC and IGBT Driving
14	CH	High-side IGBT Collector
15	EH	High-side IGBT Emitter
16	KH	High-side Diode Cathode
17	AL	Low-side Diode Anode
18	CL	Low-side IGBT Collector
19	EL	Low-side IGBT Emitter

Internal Equivalent Circuit and Input/Output Pins (Bottom View)

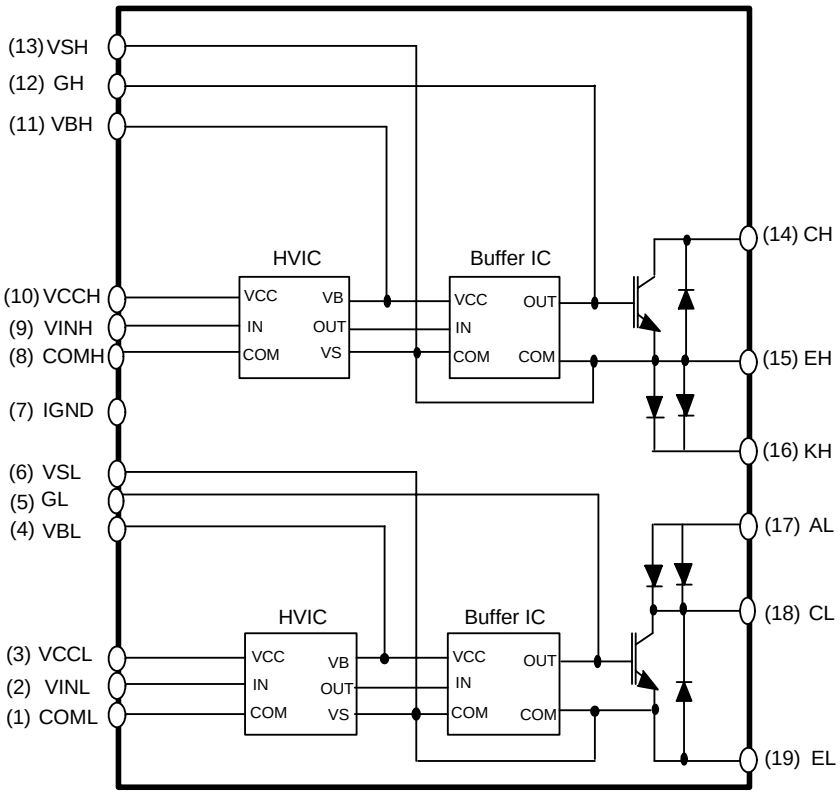


Figure 3.

Absolute Maximum Ratings (T_C = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Conditions	Rating	Units
VCC	Control Supply Voltage	Applied between VCCL-COML, VCCH - COMH	20	V
VBS	Control Bias Voltage	Applied between VBL - VSL, VBH - VSH	20	V
VIN	Input Signal Voltage	Applied between VINL-COML,VINH - COMH	-0.3~17	V

Symbol	Parameter	Conditions	Rating	Units
VCE	Collector to Emitter Voltage	Between CL to EL, Between CH to EH $V_{GH-EH}=V_{GL-EL}=0V$, $I_{CH}=I_{CL}=250\mu A$	300	V
VRRM	Peak Repetitive Reverse Voltage	Between KH to EH, Between CL to AL $I_{AH}=I_{AL}=250\mu A$	300	V
		Between CH to EH, Between CL to EL $I_{AH}=I_{AL}=250\mu A$	300	V
VIN	Input Signal Voltage	VINL, VINH	-0.3 to VCC+0.3	V
I_C	Collector Current Continuous	Between CL to EL, Between CH to EH	120	A
$I_{F(AV)}$	Average Rectified Forward Current	Between EH to KH, Between AL to CL per diode	30	A
		Between EH to CH Between EL to CL	10	A
I_{CP}	Pulsed Collector Current	Between CL to EL, Between CH to EH (Note1)	300	A
I_{FP}	Pulsed Diode Current	Between EH to KH, Between AL to CL(Note1)	300	A
		Between EH to CH Between EL to CL per diode (Note1)	100	A

Notes :

1. Pulse Width = 100μsec, Duty = 0.1; half sine wave
   *I_{cp} limited by MAX T_j

Symbol	Parameter	Conditions	Rating	Units
Pd	IGBT Dissipation	Tc=25°C per IGBT	117	W
		Tc=100°C per IGBT	47	W
	FRD Dissipation	Tc=25°C per diode	109	W
		Tc=100°C per diode	43	W
Tj	Operating Junction Temperture		-20 ~ 150	°C
T_C	Module Case Operation Temperature		-20 ~ 125	°C
T_{STG}	Storage Temperature		-40 ~ 125	°C
V_{ISO}	Isolation Voltage	60Hz, Sinusoidal, AC 1 minute, Connection Pins to IMS substrate	1500	V_{rms}

Thermal Resistance

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Junction to Case Thermal Resistance	Between CH to EH, Between CL to EL Per IGBT	-	1.07	°C/W
		Between EH to KH, Between AL to CL	-	1.15	°C/W
		Between CH to EH, Between CL to EL Per Diode	-	3.70	°C/W

Electrical Characteristics (T_C = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
I_{QCC}	Quiescent VCC Supply Current	VCC = 15V VINL, VINH = 0V	VCCL-COML, VCCH-COMH	-	-	100	μA
I_{QBS}	Quiescent VBS Supply Current	VBS = 15V VINL, VINH= 0V	VBL- VSL, VBH- VSH	-	-	500	μA
UV_{BSD}	Supply Circuit Under Voltage Protection	Detection Level		10.1	11.3	12.5	V
UV_{BSR}		Reset Level		10.5	11.7	12.9	V
$VIN_{(ON)}$	ON Threshold Voltage	Applied between VINL-COML, ,VINH - COMH		3.0	-	-	V
$VIN_{(OFF)}$	OFF Threshold Voltage			-	-	0.8	V

Symbol	Parameter	Condition		Min.	Typ.	Max.	Units
$V_{CE(SAT)}$	IGBT Collector-Emitter Saturation Voltage	VCC = VBS = 15V VIN = 5V	I_C = 25A, T_J = 25°C	-	-	1.4	V
			I_C = 120A, T_J = 25°C	-	1.9	-	V
V_F	Diode Forward Voltage	Between CL to AL Between KH to EH	I_F =30A, T_J = 25°C	-	-	1.4	V
		Between EH to CH Between EL to CL	I_F =10A, T_J = 25°C	-	-	1.7	V
td_{ON}	Switching Times	VCE=200V, VCC= VBS=15V Ic = 20A VIN = 0V ↔ 5V , Inductive Load Tc = 25°C (Note2)			230		ns
t_r					55		ns
td_{OFF}					270		ns
t_F					48		ns
I_{CES}	IGBT Collector-Emitter Leakage Current	V_{CE} = 300V		-	-	250	μA
I_R	Diode Anode-Cathode Leakage Current	Between CL to AL Between KH to EH	$V_{Anode-Cathode}$=300V			250	μA
		Between EH to CH Between EL to CL	$V_{Anode-Cathode}$=300V	-	-	250	μA

Notes :

2. t_{ON} and t_{OFF} include the propagation delay time of internal drive IC. For the detailed information, please see Figure 4.

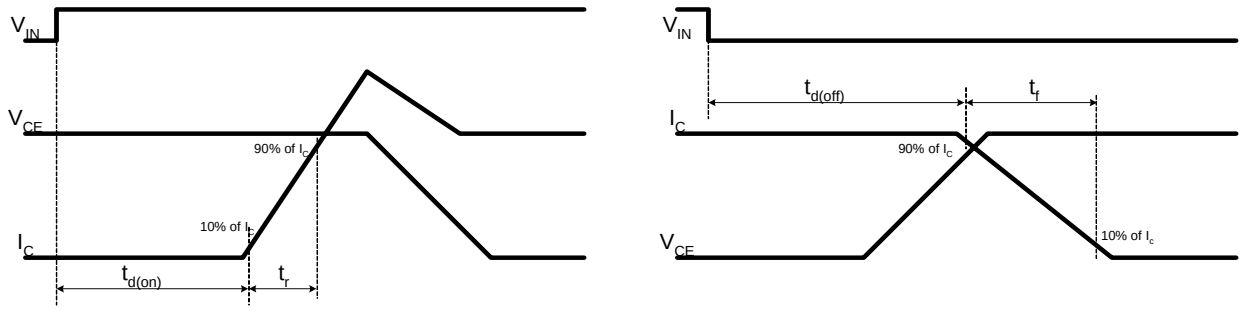


Figure 4. Switching Time Definition

Typical Performance Characteristics

Figure 5. Typical Output Characteristics

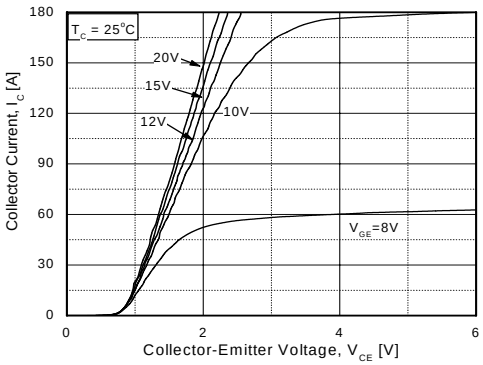


Figure 6. Typical Output Characteristics

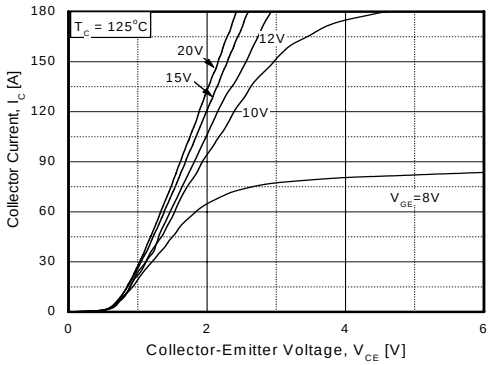


Figure 7. Typical Forward Voltage Drop

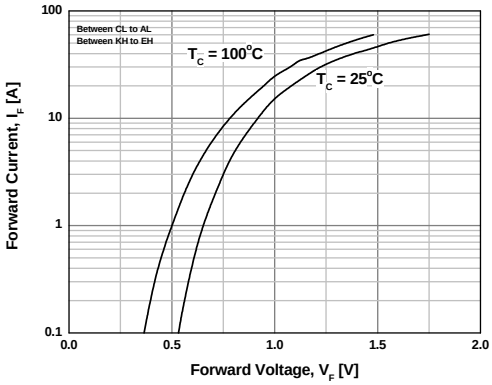


Figure 8. Typical Forward Voltage Drop

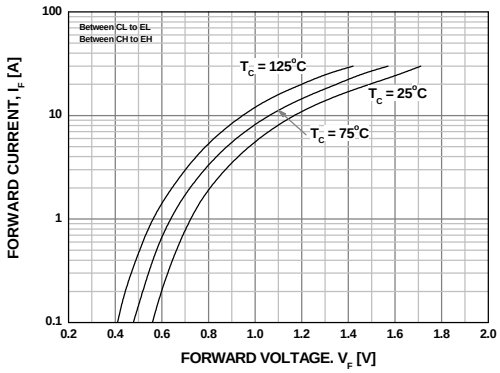
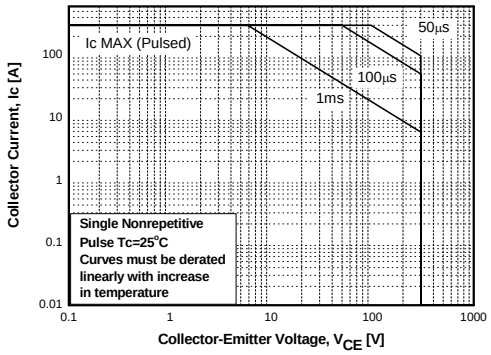


Figure 9. FBSOA



Mechanical Characteristics and Ratings

Parameter	Conditions		Limits			Units
			Min.	Typ.	Max.	
Mounting Torque	Mounting Screw: - M3	Recommended 0.62N•m	0.51	0.62	0.72	N•m
Device Flatness		Note Figure 5	0	-	+100	μm
Weight			-	13.4	-	g

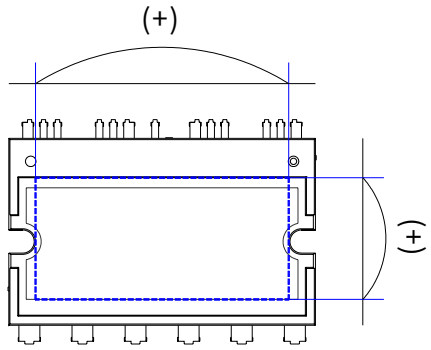


Figure 10. Flatness Measurement Position

Detailed Package Outline Drawings

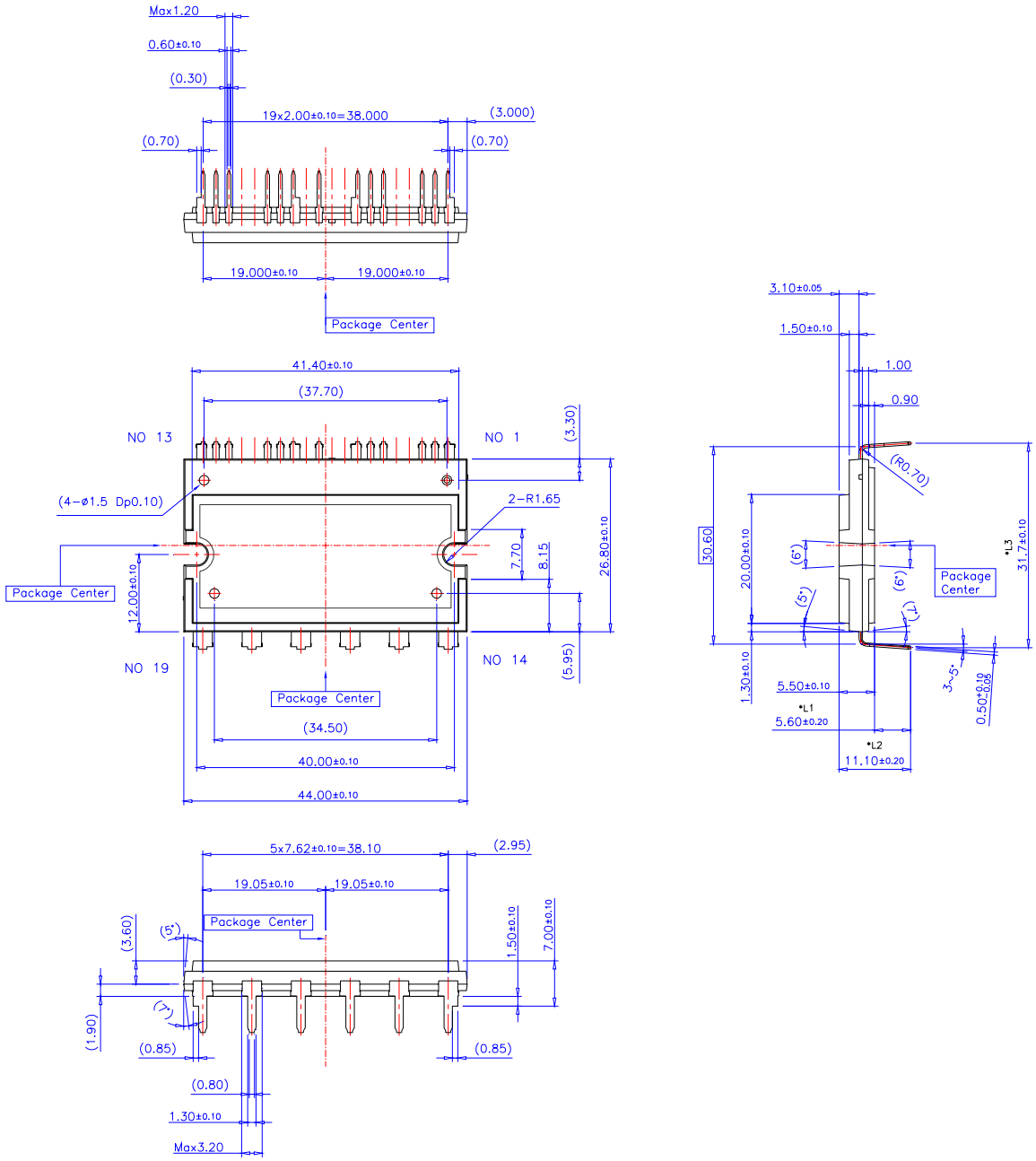


Figure 11.

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